

les convulsions mais à l'aide de petites doses de phéno-barbital, de Dilantin ou de Mysoline un contrôle satisfaisant fut obtenu sans avoir recours à la posologie élevée dont on s'était servi antérieurement. On ne réussit à substituer le Doriden à l'Elipten que dans trois cas et encore, d'une manière tout à fait limitée, mais il semble que dans ces cas l'Elipten ait instauré un changement de personnalité que le Doriden a entretenu par la suite. Un de ces malades, allergique à ce médicament-ci, n'en a pas moins conservé

l'amélioration qu'il avait reçu de celui-là. L'amélioration observée dans l'électroencéphalographie de neuf de ces douze malades n'a cependant présenté aucune corrélation avec l'amélioration de leur comportement. On n'a observé aucun effet secondaire fâcheux au cours de ces essais. Il semble que l'Elipten puisse offrir un certain intérêt dans la conduite du traitement des épileptiques sérieusement atteints, et qu'il permette une diminution considérable de la posologie des médicaments adjuvants.

SILICOTUBERCULOSIS*

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INTRODUCTION

THE ASSOCIATION of silicosis and tuberculosis has been suspected for several hundred years, but it was not until the discovery of the tubercle bacillus and the introduction of mortality statistics that this suspicion was confirmed by objective evidence.

In 1902 a committee, with J. S. Haldane as a member, was set up to investigate the high mortality among Cornish tin-miners;¹ it reported that "stone-dust predisposes enormously to tuberculosis in the lung". The work of Watkins-Pitchford² from South Africa, and Collis³ and Kettle⁴ from Britain, produced further evidence; later, workers on this continent, such as Riddell,⁵ Sander,⁶ and many others, added more information concerning the co-existence of these two diseases.

The classical experiments of Gardner⁷ demonstrated that exposure to silica causes a renewed multiplication of bacilli in the healing tuberculous lesions in guinea pigs. This susceptibility is not confined to virulent tubercle bacilli; it occurs also with avirulent strains such as BCG,⁸ with catalase-negative isoniazid-resistant bacilli,⁹ and with atypical photochromogenic and non-photochromogenic acid-fast bacilli.^{10, 11}

Numerous investigations have been conducted on the incidence of tuberculosis among silicotics. Generally the incidence was found to be high (over 25%) in autopsy material,^{12, 13} but in the clinical studies it was lower. In a group of anthracite coal miners in Pennsylvania, studied by Theodos and Gordon,¹⁴ bacteriological evidence of active pulmonary tuberculosis was found in 12.9 % of 750 cases of silicosis; in other clinical studies the incidence was as low as 3%.^{15, 16} This discrepancy between pathological and clinical findings was pointed out by Welsh workers in their investigations of progressive massive fibrosis.¹⁷ It indicates that the diagnosis of tuberculosis in these cases is often impossible during life, although tuberculosis

plays an important part in the total pathological process.

The concept of frequent association of silicosis and tuberculosis led to the search for the radiological appearances typical of this combination. It became generally accepted that rapidly developing soft nodulation, conglomerate massive shadowing and evidence of cavitation are each strongly suggestive of an infective element (usually tuberculous).¹⁸ This has been questioned by recent studies, such as those of Wall,¹⁹ who found no evidence of tuberculosis in 17 cases of silicosis with cavitation.

This brief review of the literature suggests that the association between silicosis and tuberculosis is a serious problem, particularly in areas where tuberculous infection is common. The final clinical, radiological and pathological picture in many silicotics appears to be the result of the interaction of two factors—silica dust and tubercle bacilli. Control of dust is chiefly an engineering problem, and great progress has been made in this direction.

In this study an attempt was made to assess the relative importance of the second of the two factors, tubercle bacilli, and to see to what extent this could be affected by antimicrobial therapy.

MATERIAL

In the summer of 1956, 159 ex-goldminers with silicosis, or silicosis and tuberculosis, in the Porcupine Mining Camp in Ontario, were examined or reviewed. All these men were referred by the Workmen's Compensation Board to the Timmins chest clinic for follow-up examinations, such procedure being routine in persons with silicosis leaving the mines. The group under study included practically all silicotics among the ex-miners living in the Porcupine Mining Camp in 1956. Fifty-nine of the 159 were placed on antimicrobial therapy at home and 26 were referred to sanatorium for the establishment of therapy; in addition, 33 were already in sanatorium receiving treatment. Altogether 118 cases received antimicrobial therapy and 41 did not. This was not a controlled study, and in deciding whether to recommend antimicrobial therapy in a given case several factors were taken into consideration, the most important of which was the presence of tubercle bacilli in the sputum at the time of the survey, or before it. Other factors included the general condition of the patient, his tuberculin re-

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action, his age, the extent and type of radiological abnormality, and the degree of co-operation that could be expected. All these patients have been examined periodically, and this report is based on the findings in March 1959, some two years and eight months after the commencement of the study. Most of these men were European immigrants, varying in age from 45 to 78, half being under the age of 62.

METHODS AND FINDINGS

Radiological Findings

The radiological appearances in this study were so diverse that it was found impossible to adopt any of the numerous existing classifications. The purpose of the one used here has been simply to allocate individual radiological pictures to different groups according to predominant appearances, without any attempt to interpret these appearances. The classification adopted was as follows:

- A1. Nodular opacities only.
 - A2. Nodular opacities with slight indefinite conglomeration.
 - B. Conglomerate shadows.
 - C. Massive shadowing; circumscribed shadows at least 5 cm. in diameter.
 - D. Scattered calcifications.
 - E. Abnormalities, such as increased linear markings and reticulation, in the absence of nodular opacities.
- Cases in Groups A1 and A2 are sometimes classified as "simple silicosis"; those in Groups B, C and D as "complicated silicosis".

TABLE I.—RADIOLOGICAL CLASSIFICATION

| | A1 | A2 | B | C | D | E | Total |
|--|------|------|------|------|-----|-----|-------|
| Number..... | 20 | 20 | 75 | 29 | 11 | 4 | 159 |
| Per cent..... | 12.6 | 12.6 | 47.2 | 18.2 | 6.9 | 2.5 | 100 |
| Seven had cavitation (all classified under B and C). | | | | | | | |

Table I shows that a quarter of cases had nodular opacities (Groups A1 and A2); almost half had conglomerate shadowing (Group B); the remainder showed either massive shadowing (Group C), usually a further development of conglomerate shadows, or scattered calcified densities.

Examples of these various radiological pictures are seen in Figs. 1 to 4.

Bacteriological Findings

Sputum had been examined for tubercle bacilli routinely at least once or twice a year for many years before the present study. The records of these sputum examinations were available. At the time of the survey, specimens of sputum or laryngeal swabs were obtained from all the men examined.

In just over one-third (55 cases) acid-fast bacilli were found, by culture, in the sputum on one or more occasions (Table II). Of these 55 cases, 21 had also a positive smear.

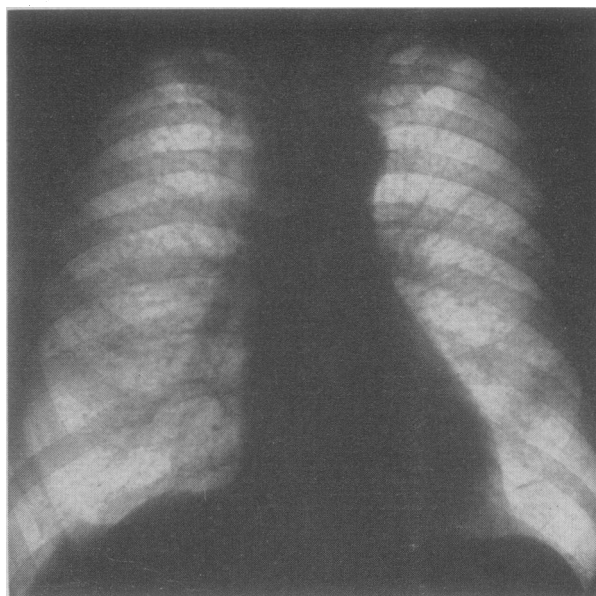


Fig. 1.—Nodular opacities only—Group A1.

TABLE II.
SPUTUM EXAMINATION FINDINGS AND X-RAY APPEARANCES

| X-ray group | | Sputum positive (by culture) | | | | Per cent positive sputum |
|-------------|---|------------------------------|-----------------|--------------|--------|--------------------------|
| | | Total cases | Sputum negative | Repeat- edly | Single | |
| A1 | Nodular opacities only..... | 20 | 14 | 3 | 3 | 30.0 |
| A2 | Nodular opacities with slight indefinite conglomeration.... | 20 | 12 | 5 | 3 | 40.0 |
| B | Conglomerate shadows..... | 75 | 47 | 18 | 10 | 37.3 |
| C | Massive shadowing..... | 29 | 21 | 7 | 1 | 27.6 |
| D | Scattered calcifications.... | 11 | 8 | 1 | 2 | 27.3 |
| E | Other abnormalities.. | 4 | 2 | 0 | 2 | 50.0 |
| Total..... | | 159 | 104 | 34 | 21 | 34.6 |

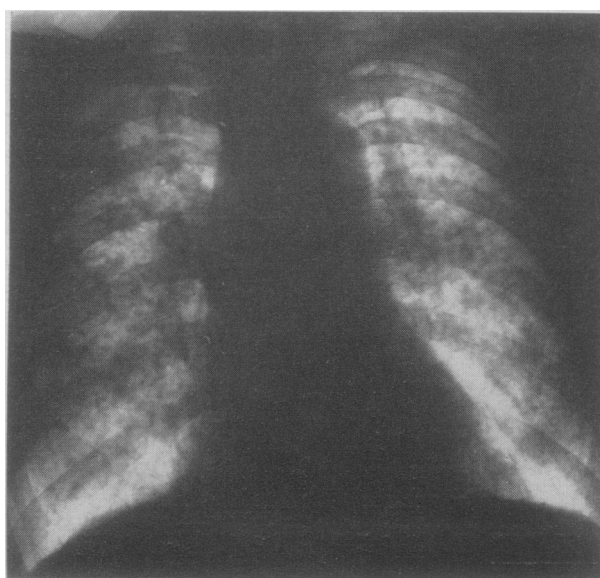


Fig. 2.—Conglomerate shadowing—Group B.

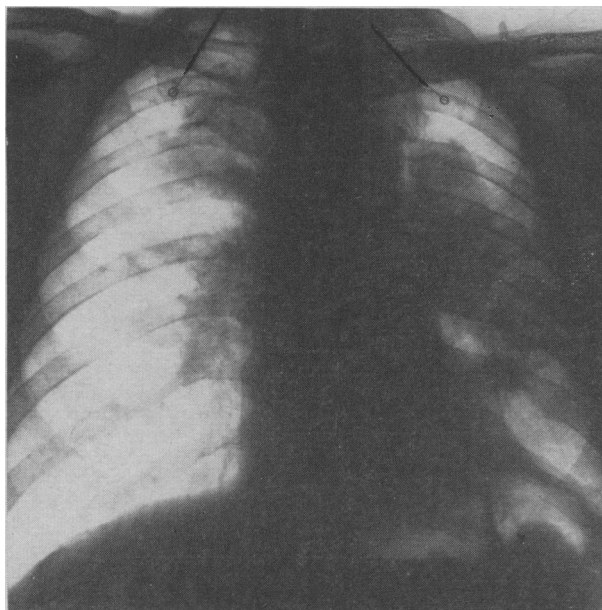


Fig. 3.—Massive shadowing. Circumscribed shadows in both upper lung fields—Group C.

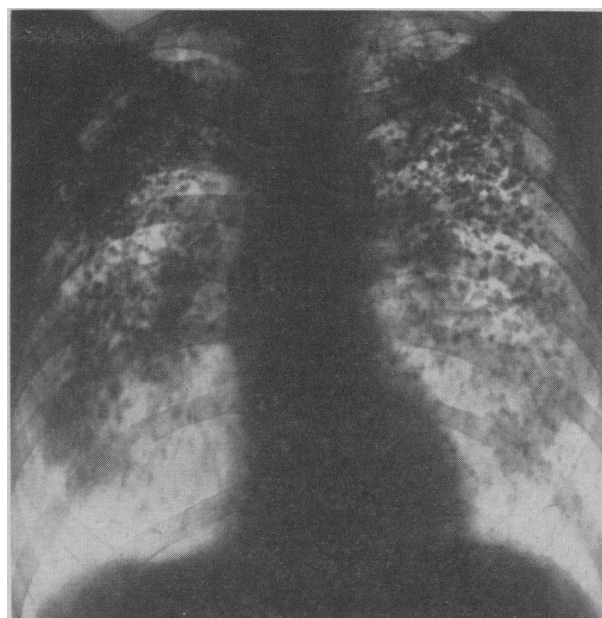


Fig. 4.—Scattered calcification. In this case there has been a progressive tendency towards aggregation of calcified densities—Group D.

Patients with a record of a single positive culture present a problem; while it is impossible to be certain in an individual case that a single positive culture is not the result of a laboratory error, the relatively large number of such instances makes this unlikely. Furthermore, in some who later had repeatedly positive sputum there had been a record of a single positive culture, followed by a large number of negative findings over a period of a few years. Thus, occasional expectoration of acid-fast bacilli can be considered one of the features of silicotuberculosis.

The fact that over one-third of all patients had positive sputum, and that in over one-fifth (21%) the sputum was repeatedly positive, points clearly to the fact that tuberculosis was a frequent complication of silicosis in this series.

The distribution of cases with positive sputum among various radiological groups is similar (see Table II). Patients with the picture of nodular opacities alone (Group A1), or nodular opacities associated with indefinite conglomeration (Group A2), show positive sputum with the frequency of the same order as those with a picture of conglomerate and massive shadowing or of multiple calcification (Groups B, C, D). This is one of the most unexpected and interesting findings in this survey.

In all seven cases with evidence of cavitation the sputum was repeatedly positive.

Tuberculin Testing

Of the 159 cases in this survey 144 were tuberculin tested. If the result of the first dose of tuberculin (5 TU) was negative, the second dose (100 TU) was used. The tests were read in 48 to 96 hours, and induration of 5 mm. or more was accepted as a positive result (Table III).

The incidence of positive tuberculin reaction in this group of silicotics is high—81.9% of them re-

acted to the first dose of tuberculin (5 TU), and another 7.6% to the second dose (100 TU). These rates are higher than those in any other group of similar age and origin in Ontario. The provincial rate for the Canadian-born males in this age group is between 50 and 60%, and for the foreign-born just over 70%.²¹ Certainly the fact that only 10% of these patients had a negative tuberculin reaction

TABLE III.—TUBERCULIN REACTION IN DIFFERENT RADIOLOGICAL CATEGORIES

| X-ray group | Total tested | Negative | Positive | | Per cent positive |
|-------------|--------------|----------|--------------|----------------|-------------------|
| | | | No. 1 (5 TU) | No. 2 (100 TU) | |
| A1 | 17 | 4 | 13 | 0 | 76.5 |
| A2 | 18 | 1 | 17 | 0 | 94.4 |
| B | 71 | 6 | 59 | 6 | 91.5 |
| C | 24 | 4 | 17 | 3 | 83.3 |
| D | 11 | 0 | 10 | 1 | 100.0 |
| E | 3 | 0 | 2 | 1 | 100.0 |
| Total | 144 | 15 | 118 | 11 | 89.6 |

does not suggest that silicosis is one of the conditions rendering patients anergic to tuberculin. All those with positive sputum had a positive tuberculin reaction; thus, a negative tuberculin reaction to both doses of tuberculin in a silicotic constitutes, in the absence of positive sputum, strong evidence against tuberculosis.

TREATMENT AND ITS RESULTS

Isoniazid, para-aminosalicylic acid (PAS) and streptomycin were the basic drugs used in treatment. They were given in various combinations—in two-drug regimens, the combination most commonly used being isoniazid and PAS. In some, who were unable to tolerate PAS, treatment with streptomycin and isoniazid was instituted; we were reluctant to give isoniazid alone.

The main difficulty experienced in the treatment arose from gastro-intestinal discomforts due to PAS; mild dyspepsia was very common, but more severe symptoms such as vomiting, abdominal cramps and diarrhoea occasionally developed. Changing the preparation of PAS, dividing the daily dose differently, and sometimes reducing the dose were helpful; it often seemed that character, stamina and motivation played a prominent part in patients carrying on with the treatment, despite mild dyspepsia. Repeated urinary tests for PAS derivatives were done, and it is to the credit of those men that not a single instance of discrepancy between the test and the patient's statement was found. For patients unable to tolerate PAS the decision to change to a streptomycin and isoniazid regimen, or to discontinue treatment, was based primarily on the record of sputum examinations—those with a record of positive finding being advised to continue with antimicrobial treatment, while in those with persistently negative sputum the patient's willingness to co-operate played a major part in the decision to continue therapy.

Isoniazid has been used in the dose of 300 to 400 mg. and sodium PAS from 8 to 14 g. daily; streptomycin, in the dose of 1 g. twice weekly. In several instances, where neurological complications of isoniazid therapy were suspected, pyridoxine (vitamin B₆) was given in the dose of 50 to 100 mg. daily.

For the purpose of analysis of the results of treatment the following classification has been used:

1. Continuous treatment for 24 months or longer without interruption.
2. Treatment for 12 to 24 months without interruption.
3. Treatment for less than 12 months if continuous, or treatment for more than 12 months with interruptions.
4. No antimicrobial therapy.

TABLE IV.—ANTIMICROBIAL THERAPY ACCORDING TO BACTERIOLOGICAL STATUS OF 137 SURVIVING PATIENTS

| <i>Treatment group</i> | <i>Sputum repeat pos.</i> | <i>Single pos. finding</i> | <i>Sputum persist. neg.</i> | <i>Total number</i> |
|--|---------------------------|----------------------------|-----------------------------|---------------------|
| 1. 24 months or longer..... | 15 | 5 | 23 | 43 |
| 2. 12-24 months..... | 6 | 5 | 12 | 23 |
| 3. Less than 12 months, or interrupted treatment.... | 8 | 2 | 30 | 40 |
| 4. No treatment..... | 1 | 6 | 24 | 31 |
| Total..... | 30 | 18 | 89 | 137 |

The distribution of the 137 surviving persons, according to the above treatment groups and sputum status, is presented in Table IV. For the sake of clarity and uniform duration of the follow-up period, 22 who died are considered separately.

Of the 30 patients who had repeatedly positive sputum only one refused treatment, and one-half (15) had continuous treatment exceeding two

years. A smaller proportion of those with negative sputum, and those with a single positive culture, had satisfactory therapy; this undoubtedly was due to the fact that we were less insistent on continuation of the treatment in such cases in the face of intolerance or toxicity.

Of the 30 with repeatedly positive sputum 26 showed sputum conversion (Table V).

TABLE V.—TREATMENT AND SPUTUM CONVERSION (Patients with Multiple Positive Finding)

| <i>Treatment group</i> | <i>Number</i> | <i>Sputum remaining positive</i> | <i>Sputum conversion</i> |
|--|---------------|----------------------------------|--------------------------|
| 1. 24 months or longer.... | 15 | 1 | 14 |
| 2. 12-24 months..... | 6 | 0 | 6 |
| 3. Less than 12 months, or interrupted treatment.. | 8 | 3 | 5 |
| 4. No treatment..... | 1 | 0 | 1 |
| Total..... | 30 | 4 | 26 (86.7%) |

Of the 21 patients who received satisfactory treatment for more than a year (Groups 1 and 2) only one failed to convert, whereas of the eight with treatment frequently interrupted three are still positive. The four who still show positive sputum have cavities. It is not without irony that the patient who refused therapy, and who previously had two positive cultures, has now consistently negative sputum.

TABLE VI.—RELATIONSHIP OF X-RAY CHANGE TO THERAPY

| <i>Treatment group</i> | <i>Improvement</i> | <i>Appearance stationary</i> | <i>Deterioration</i> |
|--|--------------------|------------------------------|----------------------|
| 1. 24 months or longer.... | 7 | 34 | 2 |
| 2. 12-24 months..... | 2 | 20 | 1 |
| 3. Less than 12 months, or interrupted treatment.. | 0 | 35 | 5 |
| 4. No treatment..... | 0 | 27 | 4 |
| Total..... | 9 | 116 | 12 |

In the great majority the x-ray appearances remained stationary; definite improvement was noted in nine, and of these seven had been in the "repeated positive sputum" category. A stationary appearance by x-ray over a period of two to three years is characteristic of this condition, and it is perhaps not surprising that there has not been any more definite change in the radiological appearances.

Of the 66 persons in categories 1 and 2 who had treatment for at least 12 months (Table IV) 32 stated that they felt better, 31 thought that they were about the same at the end of the observation period as they were at the beginning, and three felt worse. Of those who felt improved the majority thought that they were stronger; others claimed that the shortness of breath was less disabling; others lost their chronic cough. In contrast, of 71 who did not receive any treatment, or only short or interrupted courses of treatment (Categories 3 and 4), four felt better, eight felt worse, and the remainder thought that they were about the same

as they were at the beginning of the observation period. It is impossible to state to what extent these differences may be ascribed to the specific action of drugs, and to what extent they represent a psychological effect.

During the course of this study measurements of vital capacity and one-second vital capacity were obtained, using a Gáensler Collins vitalometer. There was no definite relationship between the results of respiratory function tests and antimicrobial therapy; in the majority, the function tests gave very similar values on repeated testing.

It may be said that the course of the complicating tuberculosis was definitely influenced by treatment in respect to one objective finding, namely, conversion of sputum. This is of considerable individual and public health importance.

DEATHS

Twenty-two patients died during the period of observation; in 12 the certified cause of death was "silicosis" or "silicosis with tuberculosis", and "pneumonia" or "cor pulmonale". Of the remaining 10, five died of coronary thrombosis, one of cirrhosis of the liver, one of a perforated peptic ulcer, one of acute pancreatitis, and one of hypertensive heart disease; one committed suicide.

Twelve of these 22 received antimicrobial therapy, but only three had continuous treatment for a period exceeding 12 months.

Silicosis, or silicotuberculosis, appears to have been an important factor in the deaths of at least 11 of these men.

DISCUSSION

Tuberculosis was frequently associated with silicosis in this group of ex-miners; one-third had acid-fast bacilli in the sputum, and in one out of five the sputum was positive on a number of occasions—usually over a long period of time. Nearly 90% of the patients under study had positive tuberculin reactions: this may be related to the fact that the majority were immigrants from countries where tuberculosis had been rife, but this cannot be a complete explanation, as the rates of positive tuberculin reaction were higher in this group than in groups of immigrants of the same age tested elsewhere in the province.

Lack of relationship between radiological appearance and bacteriological status has been one of the interesting and unexpected findings in this study. The picture of nodulation was associated with positive sputum almost as frequently as was conglomerate shadowing. On the other hand, 11 cases with a classical radiological picture of "complicated" silicosis not only had persistently negative sputum but also a negative tuberculin reaction; furthermore, there usually was no extension of abnormal shadows just prior to the finding of positive sputum. (A further study on a larger number of cases may show that certain radio-

logical appearances are more commonly associated with proven tuberculosis, but it is unlikely that such a correlation will ever be close enough to warrant a definite diagnosis of silicosis, complicated or uncomplicated by tuberculosis, from the radiological picture alone.) The only exception to the above statement is a clear-cut appearance of cavitation, which in this study invariably has been associated with positive sputum; however, Wall¹⁹ showed that even cavitation in his patients did not necessarily mean tuberculosis.

It is often thought that the combination of silicosis and tuberculosis is a particularly lethal disease. While this was probably true many years ago, patients with silicotuberculosis seen at present have quite a different clinical picture. Silicotuberculosis is now usually an extremely chronic disease. Reviewing the radiographs of these patients, we have been struck by the very slow progression of the lesions; it is often difficult to notice any changes in x-ray appearances from year to year, although such changes are usually apparent when radiographs taken five years apart are compared. Sometimes during the course of this slowly progressive disease a routine sputum examination will reveal tubercle bacilli. The patient may be referred to sanatorium, where repeated bacteriological studies fail to confirm the positive finding, and often he is returned home with a diagnosis of "silicosis-tuberculosis not proven". After a variable time sputum may again become positive, and this finding may then occur repeatedly. Antimicrobial therapy given at this stage will often convert the sputum to negative, but the degree of radiological improvement will, at the most, be only slight.

The management of these silicotics can best be considered in three separate groups: (1) those with positive sputum, (2) those with negative sputum but with a positive tuberculin reaction, and (3) those with negative tuberculin reaction and negative sputum.

The treatment of patients who have positive sputum is imperative; such treatment should be prolonged, and provided that the drugs do not upset the patient, may perhaps be continued indefinitely. Patients in this category are a danger to those with whom they come in contact and should be treated in sanatorium. Sputum conversion will be achieved early in the majority of such patients, and they can then be discharged—to continue treatment at home. In a few, sputum conversion is not achieved, usually because of the mechanical problem of an open tuberculous cavity. Our experience with the results of resectional surgery in this group has been most limited, but recent reports²² suggest that these men stand surgical procedures better than anticipated.

Silicotics with persistently negative sputum, along with a positive tuberculin reaction, constitute the largest group. Obviously, in this group frequent sputum examinations are necessary, as there is every reason to expect that an appreciable number

will eventually be found to have definite tuberculous disease. It is believed that some of these men should be placed on "preventive" antimicrobial therapy, on an ambulatory basis, and that if they tolerate such treatment well it should be continued for a prolonged period. On the other hand, persisting with treatment in the face of gastro-intestinal symptoms caused by PAS, or other toxic reactions, is probably not justified. The patients in this group do not need to be isolated in sanatorium for public health reasons, and, generally, it is unnecessary to recommend sanatorium admission. If there are any special reasons for admission to sanatorium, suitable arrangements must be made for their protection from sources of further infection.

Patients with negative sputum and a negative tuberculin reaction should not receive antimicrobial therapy. While there are occasional sputum-positive silicotics who have a negative tuberculin reaction, they are extremely rare. In any silicotic with persistently negative sputum and a negative tuberculin reaction the odds are greatly against the presence of tuberculosis, whatever the radiological and clinical findings. If tuberculosis is suspected, thorough bacteriological studies are indicated, but treatment should not be instituted until typical tubercle bacilli are grown from the sputum, laryngeal swab or gastric lavage. If acid-fast bacilli are seen in the sputum smear of a tuberculin-negative silicotic they may prove to be "atypical"; sensitivities of such organisms should be established before therapy is commenced.

This study shows that in this group of silicotics tuberculosis is a frequent complication. This is not surprising, as many of these miners were probably exposed to infection in the mines when the morbidity was high; many were immigrants, who presumably were tuberculin-positive on entry to the industry. The majority of new entrants to mining and other hazardous industries today are not infected by tubercle bacilli. The present infection rate for men 20 to 29 years of age, born in Canada, is about 20%.²¹ It is too early to attempt to have a completely tuberculin-negative working force in hazardous industries. It is not too early, however, to establish periodic tuberculin testing of all the negative reactors exposed to silica dust, and to institute proper investigation and management of those who become infected while in employment. Frequent routine sputum examination of positive reactors exposed to silica may well prove to be rewarding, and may throw further light on the still poorly understood mechanism of the association of silicosis and tuberculosis.

SUMMARY

One hundred and fifty-nine ex-goldminers with silicosis, or silicotuberculosis, were studied and followed for two and one-half years; 34.6% had a positive sputum culture for tubercle bacilli on one or more occasions. There was lack of correlation between

bacteriological and radiological findings. The frequency of positive sputum was of the same order in patients with only nodular opacities as in those with conglomerate and massive shadowing on radiographic examination. A positive tuberculin reaction was found in 89.6%. All sputum-positive silicotics had positive tuberculin reactions. Of the surviving patients, 43 had continuous antimicrobial treatment for a period exceeding two years, and 23 had such therapy for over one year. Of the 30 patients with repeatedly positive sputum, conversion occurred in 26.

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REFERENCES

1. Report on the Health of Cornish Miners, Eyre & Spottiswoode, London, 1904, p. 92.
2. WATKINS-PITCHFORD, W.: *M. J. S. Africa*, 9: 196, 1914.
3. COLLIS, E. L.: Industrial pneumoconioses with special reference to dust phthisis, Milroy Lectures, 1915, H.M. Stationery Office, London, 1919.
4. KETTLER, E. H.: *J. Indust. Hyg.*, 8: 491, 1926.
5. RIDDELL, A. R.: *Am. Rev. Tuberc.*, 29: 36, 1934.
6. SANDER, O. A.: *J. Indust. Med.*, 7: 399, 1938.
7. GARDNER, L. U.: *Am. Rev. Tuberc.*, 20: 833, 1929.
8. VORWALD, A. J. et al.: *Ibid.*, 62: 455, 1950.
9. STEENKEN, W. et al.: *Ibid.*, 78: 309, 1958.
10. DWORSKI, M. et al.: *Indust. Med.*, 26: 536, 1957.
11. SCHEPERS, G. W. H. et al.: *Ibid.*, 27: 27, 1958.
12. CHARR, R., COHEN, A. C. AND BATTAG, O. L.: *Internat. Clin.*, 3: 195, 1938.
13. GOODING, C. G.: *Lancet*, 2: 891, 1946.
14. THEODOS, P. A. AND GORDON, B.: *Am. Rev. Tuberc.*, 65: 24, 1952.
15. STEWART, A.: *Brit. J. Indust. Med.*, 5: 120, 1948.
16. SANDER, O. A.: *J. A. M. A.*, 141: 813, 1949.
17. CARPENTER, R. G. et al.: *Tubercle*, 37: 225, 1956.
18. PANCOAST, H. K. AND PENDERGRASS, E. P.: *Am. J. Roentgenol.*, 14: 381, 1925.
19. WALL, N. M.: *Am. Rev. Tuberc.*, 71: 544, 1955.
20. GERNEZ-RIEUX, C.: Proceedings of Third International Conference of Experts on Pneumoconiosis, Sydney, February-March, 1950, Vol. II, p. 43, International Labour Office, Geneva, 1953.
21. GRZYBOWSKI, S.: *Ontario M. Rev.*, 26: 571, 1959.
22. ANDREWS, N. C. et al.: *Am. Rev. Tuberc.*, 77: 62, 1958.

RÉSUMÉ

L'observation pendant deux ans et demi de 159 malades, tous d'anciens mineurs d'or, atteints de silicose ou de silicotuberculose, a fourni le sujet de cet article. Au moins une fois, 34.6% d'entre eux ont eu des crachats tuberculeux positifs. On n'obtint aucune corrélation entre les données de la bactériologie et celles de la radiographie. La fréquence des crachats positifs fut la même, que les ombres aient été nodulaires ou denses et homogènes. Une tuberculino-réaction positive fut obtenue chez 89.6% d'entre eux. Tous les silicosés avaient une réaction tuberculinique positive. Chez les survivants, 43 reçurent une thérapie antimicrobienne continue pendant au delà de deux ans et 23 pendant plus d'un an. De 30 malades à crachats continuellement positifs, on obtint un revirement chez 26.

THE LECTURER

One point a lecturer should remember. It is doubtful if many students will retain very much of the content of a lecture. It is likely that in a short space of time many of the pearls of wisdom, which have been so carefully prepared, will have gone completely from the student's mind. This does not matter, particularly if the student has been stimulated to think and read for himself.—*Canad. Dental A. J.*, 26: 129, 1960.